

NASA Air Force Cost Model: A Potent Parametric Cost Estimating Tool

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The Engineering Cost Office of the Program Development Directorate at MSFC provides comprehensive cost estimates for new projects as well as those projects under consideration for development. The following paragraphs provide an overview of the NASA Air Force cost model (NAFCOM). This automated model, currently in its fifth version, makes use of regression analysis methodology and is one of the primary cost estimating tools within the office. It was developed under contract for MSFC by the Science Applications International Corporation (SAIC).

At the core of NAFCOM is its data base. This data base contains elements of cost (including first pound cost), weight, and other data for 9 manned spacecraft, 75 unmanned spacecraft, 10 launch vehicle stages, 4 liquid rocket engines, and approximately 350 space-based scientific instruments. Technical and programmatic data are provided for each program or data point to enhance the understanding needed for the analyst to select analogous data in the development of a weight-driven cost estimate. The first breakout or subdivision of the data base is into one of four major categories:

- Manned spacecraft;
- Unmanned spacecraft;
- Launch vehicle stage and engine; and
- Scientific instruments.

Each project is then further categorized into its system and subsystems/component costs. For each of these further divisions, costs are divided once again into flight unit costs and development costs. A separate cost estimating relationship (CER) is developed for each of these elements. Total project costs are determined as costs for all of these

components are summed in the final stages of cost estimating. NAFCOM CER's are subsystem unique and were derived from averages taken from some 100 historical space missions making up over 1,000 subsystem data points.

A comprehensive listing of data points is provided for each project subsystem/component within the NAFCOM data base. The NAFCOM user, in developing a cost estimate, may use overall average CER's, or may generate unique CER's by combining CER's from one or more projects that most closely parallel the new project whose cost he is estimating.

Integration costs are generated for each estimate at the total project level. Integration costs are defined as the costs for integration of components/subsystems and associated system level functions. The following are included elements of integration costs:

- Integration, assembly, and check-out;
- System test and operations;
- Ground support equipment;
- Systems engineering and integration;
- Management; and
- Launch operations orbital support.

Integration cost CER's are also developed by using overall average CER's or generating unique CER's by selecting projects that are similar in system integration activities. Once the hardware and integration costs have been determined, these costs are adjusted for inflation to any desired year by the model.

The search and filter routines in the model allow users to select projects that used low-cost, new ways of doing business approaches. If the project to be estimated plans to use the same low-cost approaches, then the resulting estimate will include similar cost reductions.

Consequently, by means of a user-friendly data base and program, the NAFCOM user can bring together the procedures described above to arrive at legitimate and defensible cost estimate. NAFCOM has proven itself

to be a valuable cost-estimating tool at MSFC and is being accepted at other NASA centers and by the U.S. Air Force. Until recently this model was limited to only government distribution because of proprietary cost data included in the data base. However, a nonproprietary version of NAFCOM has been developed and is available upon request to any commercial company willing to provide data to be used within the model. This tool can be of great value to space hardware developers in preparing cost proposals for contracts as well as for evaluation of subcontractor proposals.

"Executive Summary." NASA Cost Model, vol. 1, 1993.

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Biographical Sketch: Carey Thompson works in Aerospace Technical Management in MSFC's Engineering Cost Office, where he provides cost estimates for potential new NASA space projects. Thompson earned a B.S. degree at the U.S. Military Academy, and an MBA at the Florida Institute of Technology. ●